

SEP 25 2006

## Amendment and Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

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Confirmation No.: 9160

Filed: 24 July 2003

For: AMIDE-FUNCTIONAL POLYMERS, COMPOSITIONS, AND METHODS

Amendments to the Claims

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

1. **(Currently Amended)** A reactive polymer prepared by a method comprising: combining and copolymerizing monomers comprising N-isopropylacrylamide and a hydroxy-functional (meth)acrylate monomer to form a hydroxy-functional polymer; and reacting the hydroxy-functional polymer with a hydroxy-reactive material selected from the group consisting of a (meth)acrylate-functional isocyanate, a (meth)acrylate-functional epoxide, a vinyl azlactone, and combinations thereof,  
wherein the reactive polymer comprises comprising a non-terminal monomeric unit comprising a pendant ethylenically unsaturated group and copolymerized N-isopropylacrylamide.
2. **(Original)** The reactive polymer of claim 1 wherein the pendant ethylenically unsaturated group comprises a (meth)acrylate group.
3. **(Currently Amended)** A reactive polymer prepared by a method comprising: combining and copolymerizing monomers comprising N-isopropylacrylamide and a hydroxy-functional (meth)acrylate monomer to form a hydroxy-functional polymer; and reacting the hydroxy-functional polymer with a hydroxy-reactive material selected from the group consisting of a (meth)acrylate-functional isocyanate, a (meth)acrylate-functional epoxide, a vinyl azlactone, and combinations thereof,  
wherein the reactive polymer comprises comprising:  
1% by weight to 90% by weight of non-terminal monomeric units  
comprising a pendant ethylenically unsaturated group, based on the total weight of  
monomeric units; and

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1% by weight to 99% by weight of copolymerized N-isopropylacrylamide, based on the total weight of monomeric units.

## 4. (Original) The reactive polymer of claim 3 comprising:

5% by weight to 50% by weight of non-terminal monomeric units comprising a pendant ethylenically unsaturated group, based on the total weight of monomeric units; and

50% by weight to 95% by weight of copolymerized N-isopropylacrylamide, based on the total weight of monomeric units.

## 5. (Original) The reactive polymer of claim 4 comprising:

10% by weight to 30% by weight of non-terminal monomeric units comprising a pendant ethylenically unsaturated group, based on the total weight of monomeric units; and

70% by weight to 90% by weight of copolymerized N-isopropylacrylamide, based on the total weight of monomeric units.

6. (Currently Amended) A reactive polymer prepared by a method comprising:

combining and copolymerizing monomers comprising N-isopropylacrylamide and a hydroxy-functional (meth)acrylate monomer to form a hydroxy-functional polymer; and reacting the hydroxy-functional polymer with a hydroxy-reactive material selected from the group consisting of a (meth)acrylate-functional isocyanate, a (meth)acrylate-functional epoxide, a vinyl azlactone, and combinations therof,

wherein the reactive polymer comprises comprising a polymeric backbone having at least three ethylenically unsaturated pendant groups and a plurality of pendant groups of the formula -C(O)NHCH(CH<sub>3</sub>)<sub>2</sub> attached to the backbone.

## 7. (Original) The reactive polymer of claim 6 wherein the ethylenically unsaturated pendant groups comprise (meth)acrylate groups.

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8. **(Withdrawn - Currently Amended)** A method of preparing a reactive polymer comprising:

combining and copolymerizing monomers comprising N-isopropylacrylamide and a hydroxy-functional (meth)acrylate monomer to form a hydroxy-functional polymer; and

reacting the hydroxy-functional polymer with a hydroxy-reactive material selected from the group consisting of a (meth)acrylate-functional isocyanate, a (meth)acrylate-functional epoxide, a vinyl azlactone, and combinations thereof.

9. **(Withdrawn)** The method of claim 8 wherein the hydroxy-reactive material is selected from the group consisting of 2-isocyanatoethyl methacrylate, 4,4-dimethyl-2-vinyl-2-oxazolin-5-one, and combinations thereof.

10. **(Withdrawn)** The method of claim 8 wherein the monomers further comprise acrylamide.

11. **(Withdrawn - Currently Amended)** A method of preparing a reactive polymer comprising:

combining and copolymerizing monomers comprising N-isopropylacrylamide and vinyl azlactone to form an azlactone-functional polymer; and

reacting the azlactone-functional polymer with a hydroxy-functional (meth)acrylate.

12. **(Withdrawn)** The method of claim 11 wherein the azlactone is 4,4-dimethyl-2-vinyl-2-oxazolin-5-one.

13. **(Withdrawn)** The method of claim 11 wherein the hydroxy-functional (meth)acrylate is 2-hydroxyethyl methacrylate.

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14. (Withdrawn) The method of claim 11 wherein the monomers further comprise acrylamide.

15-23. (Canceled)

24. (Withdrawn - Currently Amended) A composition comprising:  
~~a reactive polymer according to claim 1 comprising a non-terminal monomeric unit comprising a pendant ethylenically unsaturated group and copolymerized N-isopropylacrylamide; and water.~~

25. (Withdrawn) The composition of claim 24 wherein the composition is thermally responsive.

26. (Withdrawn) The composition of claim 24 wherein the composition is suitable for use in the oral environment.

27. (Withdrawn) The composition of claim 24 wherein the pendant ethylenically unsaturated group comprises a (meth)acrylate group.

28. (Withdrawn) The composition of claim 24 further comprising an initiator.

29. (Withdrawn) The composition of claim 28 wherein the initiator is a photoinitiator.

30. (Withdrawn) The composition of claim 28 wherein the initiator is a free radical initiator.

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31. (Withdrawn) The composition of claim 24 further comprising an oxidizing agent and a reducing agent.

32. (Withdrawn) The composition of claim 24 further comprising a polymerizable component different than the reactive polymer.

33. (Withdrawn - Currently Amended) A composition comprising:

1% by weight to 99% by weight of a reactive polymer according to claim 3 comprising a non-terminal monomeric unit comprising a pendant ethylenically unsaturated group and copolymerized N-isopropylacrylamide, based on the total weight of the dental composition; and water.

34-43. (Canceled)

44. (Withdrawn - Currently Amended) A method of hardening a composition on a surface comprising:

applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the surface, the composition comprising water and a reactive thermally responsive viscosity modifier comprising a polymer according to claim 1 comprising a non-terminal monomeric unit comprising a pendant ethylenically unsaturated group and copolymerized N-isopropylacrylamide;

allowing the composition to warm to a treatment temperature and exhibit a thermal response; and

inducing the reactive thermally responsive viscosity modifier to react.

45. (Withdrawn) The method of claim 44 wherein the composition further comprises an

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initiator.

46. (Withdrawn) The method of claim 45 wherein the initiator is a photoinitiator.
47. (Withdrawn) The method of claim 45 wherein the initiator is a free radical initiator.
48. (Withdrawn) The method of claim 44 wherein the composition further comprises an oxidizing agent and a reducing agent.
49. (Withdrawn) The method of claim 44 wherein inducing reaction comprises irradiating the composition.
50. (Withdrawn) The method of claim 49 wherein irradiating comprises irradiating the composition with visible or ultraviolet light.
51. (Withdrawn) The method of claim 44 wherein inducing reaction comprises introducing one or more additional components.
52. (Withdrawn) The method of claim 44 wherein the thermally responsive composition comprises two or more parts, and wherein applying the composition comprises combining the two or more parts.
53. (Withdrawn) The method of claim 52 wherein combining comprises using a static mixing device.
54. (Withdrawn) The method of claim 44 wherein the surface is a surface of a body.

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55. (Withdrawn) The method of claim 54 wherein the surface of the body is an oral surface.

56. (Withdrawn) The method of claim 55 wherein the oral surface is selected from the group consisting of bone, tooth, tongue, gingiva, throat, and combinations thereof.

57. (Withdrawn) A thermally responsive composition comprising:

a polymer comprising polymerized N-isopropylacrylamide;  
a polymerizable component different than the polymer; and  
water.

58. (Withdrawn) A method of preparing a hardened composition on a surface comprising:  
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the surface, the composition comprising:

a polymer comprising polymerized N-isopropylacrylamide;  
a polymerizable component different than the polymer; and  
water;  
allowing the composition to warm to a treatment temperature; and  
inducing the polymerizable component to polymerize.

59. (New) A reactive polymer prepared by a method comprising:

combining and copolymerizing monomers comprising N-isopropylacrylamide and vinyl azlactone to form an azlactone-functional polymer; and  
reacting the azlactone-functional polymer with a hydroxy-functional (meth)acrylate,  
wherein the reactive polymer comprises a non-terminal monomeric unit comprising a pendant ethylenically unsaturated group and copolymerized N-isopropylacrylamide.

60. (New) The reactive polymer of claim 59 wherein the pendant ethylenically unsaturated

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group comprises a (meth)acrylate group.

61. (New) A reactive polymer prepared by a method comprising:  
combining and copolymerizing monomers comprising N-isopropylacrylamide and vinyl azlactone to form an azlactone-functional polymer; and  
reacting the azlactone-functional polymer with a hydroxy-functional (meth)acrylate  
wherein the reactive polymer comprises:  
1% by weight to 90% by weight of non-terminal monomeric units  
comprising a pendant ethylenically unsaturated group, based on the total weight of  
monomeric units; and  
1% by weight to 99% by weight of copolymerized N-isopropylacrylamide,  
based on the total weight of monomeric units.
62. (New) The reactive polymer of claim 61 comprising:  
5% by weight to 50% by weight of non-terminal monomeric units comprising a pendant  
ethylenically unsaturated group, based on the total weight of monomeric units; and  
50% by weight to 95% by weight of copolymerized N-isopropylacrylamide, based on the  
total weight of monomeric units.
63. (New) The reactive polymer of claim 62 comprising:  
10% by weight to 30% by weight of non-terminal monomeric units comprising a pendant  
ethylenically unsaturated group, based on the total weight of monomeric units; and  
70% by weight to 90% by weight of copolymerized N-isopropylacrylamide, based on the  
total weight of monomeric units.
64. (New) A reactive polymer prepared by a method comprising:  
combining and copolymerizing monomers comprising N-isopropylacrylamide and vinyl

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azlactone to form an azlactone-functional polymer; and

reacting the azlactone-functional polymer with a hydroxy-functional (meth)acrylate, wherein the reactive polymer comprises a polymeric backbone having at least three ethylenically unsaturated pendant groups and a plurality of pendant groups of the formula -C(O)NHCH(CH<sub>3</sub>)<sub>2</sub> attached to the backbone.

65. (New) The reactive polymer of claim 64 wherein the ethylenically unsaturated pendant groups comprise (meth)acrylate groups.

66. (New) A composition comprising:

a reactive polymer according to claim 59; and  
water.

67. (New) The composition of claim 66 wherein the composition is thermally responsive.

68. (New) The composition of claim 66 wherein the composition is suitable for use in the oral environment.

69. (New) The composition of claim 66 wherein the pendant ethylenically unsaturated group comprises a (meth)acrylate group.

70. (New) The composition of claim 66 further comprising an initiator.

71. (New) The composition of claim 70 wherein the initiator is a photoinitiator.

72. (New) The composition of claim 70 wherein the initiator is a free radical initiator.

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73. (New) The composition of claim 66 further comprising an oxidizing agent and a reducing agent.

74. (New) The composition of claim 66 further comprising a polymerizable component different than the reactive polymer.

75. (New) A composition comprising:

1% by weight to 99% by weight of a reactive polymer according to claim 61, based on the total weight of the dental composition; and  
water.

76. (New) A method of hardening a composition on a surface comprising:  
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the surface, the composition comprising water and a reactive thermally responsive viscosity modifier comprising a polymer according to claim 59;  
allowing the composition to warm to a treatment temperature and exhibit a thermal response; and  
inducing the reactive thermally responsive viscosity modifier to react.

77. (New) The method of claim 76 wherein the composition further comprises an initiator.

78. (New) The method of claim 77 wherein the initiator is a photoinitiator.

79. (New) The method of claim 77 wherein the initiator is a free radical initiator.

80. (New) The method of claim 76 wherein the composition further comprises an oxidizing agent and a reducing agent.

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81. (New) The method of claim 76 wherein inducing reaction comprises irradiating the composition.
82. (New) The method of claim 81 wherein irradiating comprises irradiating the composition with visible or ultraviolet light.
83. (New) The method of claim 76 wherein inducing reaction comprises introducing one or more additional components.
84. (New) The method of claim 76 wherein the thermally responsive composition comprises two or more parts, and wherein applying the composition comprises combining the two or more parts.
85. (New) The method of claim 84 wherein combining comprises using a static mixing device.
86. (New) The method of claim 76 wherein the surface is a surface of a body.
87. (New) The method of claim 86 wherein the surface of the body is an oral surface.
88. (New) The method of claim 87 wherein the oral surface is selected from the group consisting of bone, tooth, tongue, gingiva, throat, and combinations thereof.